SITE Program Description

Introduction

The Environmental Protection Agency's (EPA) Superfund Innovative Technology Evaluation (SITE) Program has successfully promoted the development, commercialization, and implementation of innovative hazardous waste site remediation and characterization technologies for more than 15 years. The SITE Program is currently composed of a Demonstration Program, a Monitoring and Measurement Technology (MMT) Program, and information transfer. Figure 1 below shows the locations of completed SITE projects for both the Demonstration and MMT Programs. SITE offers a mechanism for conducting joint technology demonstration and evaluation projects at hazardous waste sites through the involvement of the private sector, EPA, and other federal and state agencies. Commercialization of innovative technologies is assisted by providing potential users with high quality, unbiased, defendable performance and cost data. SITE promotes commercial application of innovative technologies through an extensive technology transfer program. This section will describe each component of SITE, and the overall program principles used for planning and guidance of the Program.

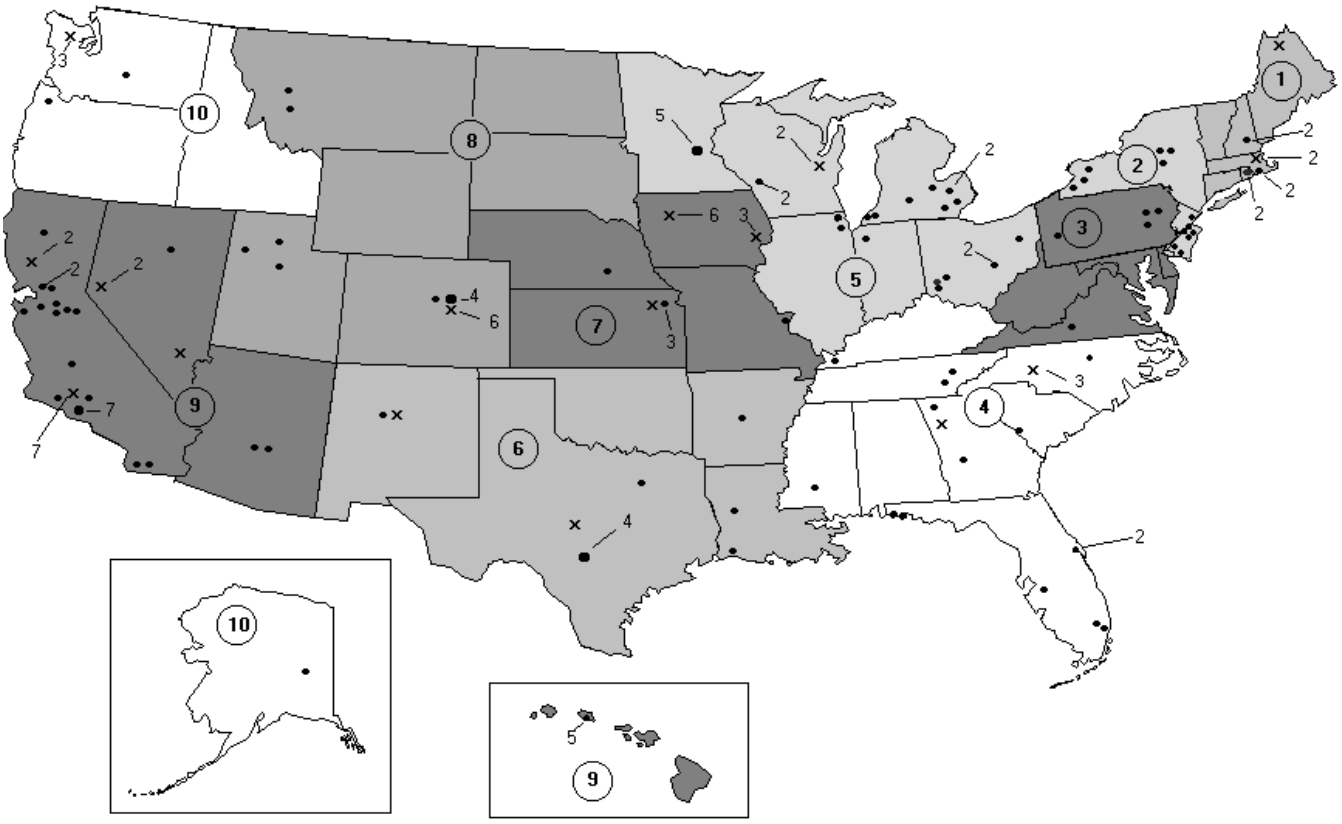


Figure 1. Location of all completed SITE Demonstration (•) and MMT (V) Projects (EPA Regions shown in circles).

Program Design

The SITE Program is currently comprised of the following key elements:

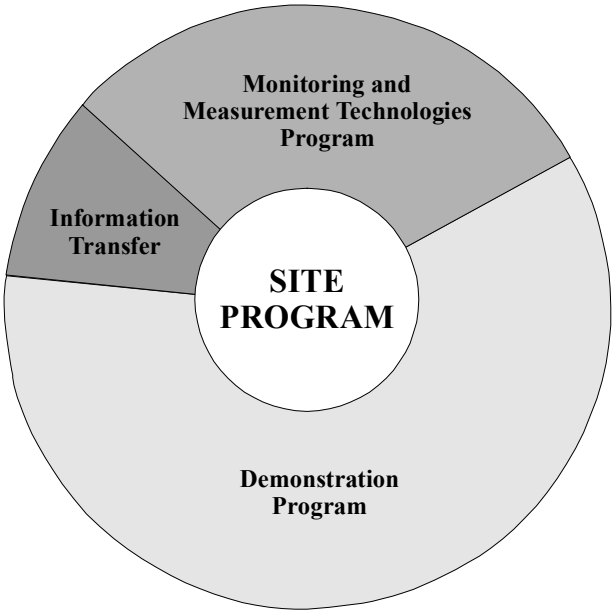
- ***Demonstration Program***
  Evaluates and verifies cost and performance of promising innovative technologies at selected hazardous waste sites to provide reliable performance, cost, and applicability information for site cleanup decision-making

- ***Monitoring and Measurement Technologies Program***
  Evaluates technologies that detect, monitor, and measure hazardous and toxic substances to provide more cost-effective and accurate methods for producing real-time data during site characterization and remediation

- ***Information Transfer Activities***
  Disseminates technical information, including engineering, performance, and cost data, to assist in removing barriers for use of innovative and alternative technologies

Program Implementation

SITE is a partnership between the public and private sectors, where the costs and responsibilities are shared by EPA, hazardous waste site owners, and technology developers. EPA enters into cooperative arrangements with site owners and technology developers, under which innovative technologies are demonstrated at selected hazardous waste sites. EPA evaluates the new technologies based on the demonstration results, and compiles and publishes rigorous engineering, performance, and cost data intended to aid in decisions regarding the use of the technologies at other hazardous waste sites. The program generates credible and unbiased technology cost and performance data needed by remedial project managers, consultants, and other environmental decision makers. EPA promotes easy and rapid access to this information,



allowing project managers to make timely decisions in selecting cleanup remedies.

Historically, one of the greatest factors inhibiting the development and use of innovative cleanup technologies has been the lack of credible cost and performance data during technology development at the commercial scale. Understandably, many site owners are unwilling to risk the use of innovative technologies without assurance of success. By addressing this need, SITE has aided in the first-time field use of many technologies, contributing to wider acceptance of a particular technology. Providing this credible, unbiased cost and performance data remains the foundation of SITE.

The program is participating with 146 remediation technology vendors. The SITE Program has successfully demonstrated 121 technologies, including 13 during FY 00. Recognizing the need for a shift from ex situ remediation, there are currently 22 in situ technologies being developed/demonstrated out of the Program's 24 total technologies. SITE's Monitoring and Measuring Technologies (MMT) Program has completed 45 projects to date, with 6 more in the planning stages. The Emerging Technology program has completed 73 projects.

The foundation of the SITE Program is providing credible cost and performance data.

Program Principles

To reduce expenditures and to remain at the forefront of innovative technology development, the SITE Program reviewed its approach to doing business in fiscal year (FY) 1996. As a result, operational shifts in the program were made to streamline the process of identifying and developing the most sought-after technology types and treatment methods. Building on the strengths of the existing program, such as demonstration design, quality assurance, and technology transfer, the SITE Program shifted in FY 97 from a technology-driven focus to a remediation problem focus, driven by the needs of the hazardous waste remediation community. EPA's vision of the SITE Program is to remain the premiere program for enhancing the credibility and implementation of effective innovative remediation options.

In FY 00 the program continued to focus on cost-effective solutions to common remediation problems. The success of the program's focus is illustrated in the strong response to solicitations for technologies, and the great interest in resource leveraging with the SITE Program from federal and state agencies, such as the Department of Defense (DOD), Department of Energy (DOE), and State environmental protection agencies.

The SITE Program is defined by the following four operating principles: (1) program planning, (2) matching priority sites with innovative cleanup solutions, (3) technology field demonstrations, and (4) information dissemination.

Demonstration Program

In the Demonstration Program, innovative cleanup technologies are field tested on hazardous waste materials. SITE demonstrations are conducted at hazardous waste sites, such as those on the National Priorities List (NPL); Brownfield sites; other non-NPL sites; or under simulated hazardous waste site conditions at developer or federal test and evaluation facilities. Engineering, performance, and cost data are gathered on innovative technologies. The data can then be reviewed by potential users to evaluate applicability to similar waste sites or to compare effectiveness and costs to other alternatives. Data collected during each field demonstration are used to assess the performance of the technology, the potential need for pre- or post-processing of the waste, applicable types of wastes and contaminated media (for example, soil, sludge, water, sediment), potential operating problems, limitations, and approximate capital, operating, and maintenance costs.

The SITE Program annually solicits applications for participation in the Demonstration Program from interested private firms and federal and state agencies with responsibility for cleanup operations at hazardous waste sites. Cooperative arrangements or Memoranda of Understanding form the relationship between the SITE Program and the parties responsible for the host site. No contractual agreement is arranged and no funds are given to the site as part of this arrangement. SITE provides in-kind service in the form of project planning, testing, sampling/analytical services, data analysis, and report writing.

Host site owners (see Appendix B for sites categorized by state and location) are responsible for providing necessary data related to the hydrogeology and other site conditions, results of feasibility studies, and results of waste analyses. The owner is responsible for all logistical requirements for the demonstration, such as availability of utilities, access to land area at the site large enough for equipment setup, elimination or restriction of geographical or

geological hindrances, security provisions, and personnel safety provisions. Technology developers whose systems are demonstrated are responsible for transporting equipment to the selected site, operating their systems, and removing equipment from the site upon completion of the demonstration. EPA is financially and technically responsible for project planning, sampling and analysis, quality assurance and quality control, preparing evaluation reports, and disseminating cost and performance information to environmental managers. EPA also prepares evaluation reports, bulletins, project summaries, and videotapes to document demonstration activities. These reports and videotapes evaluate available information on the technology and analyze its overall applicability to other site characteristics, waste types, and waste matrices. Reports also include rigorous testing procedures and the quality assurance and quality control standards.

As of September 30, 2000, the Demonstration Program included 146 demonstrations which were either accepted, ongoing, or completed. These technologies are presented alphabetically in Appendix A, according to the state in which the developer's business is located.

Monitoring and Measurement Technology Program

The MMT Program provides developers of innovative hazardous waste measurement and monitoring technologies with an opportunity to demonstrate a technology's performance under actual field conditions. Following the demonstration, EPA compiles the results and prepares a report summarizing the findings. Distribution of technical reports enhances market acceptance and can define new applications for the technology.

The purpose of the MMT Program is to accelerate the acceptance and use of effective innovative measurement and monitoring technologies in the field. These technologies include new or modified technologies that can detect, monitor, and measure hazardous and toxic substances in the subsurface, soil, sediment, waste materials, and surface waters. Technologies tested in the program include chemical sensors for in situ measurements, groundwater sampling devices, soil and core sampling devices, soil gas or fluid samplers, laboratory and field-portable analytical equipment, and other systems that support field sampling or data acquisition and analysis. The primary objectives of this portion of the SITE program are to:

- Test field analytical technologies that enhance monitoring and site characterization capabilities
- Identify performance attributes of new technologies addressing field characterization and monitoring problems more cost-effectively and efficiently
- Prepare protocols, guidelines, and methods that enhance the acceptance of these technologies for routine use.

MMT Program technologies can be used to accurately assess the degree of contamination at a site, provide data to evaluate potential effects on human health and the environment, supply data to assist in selecting the most appropriate cleanup action, and monitor the effectiveness of a remediation technology. The selection process places high priority on technologies that provide more cost-effective, faster, and safer methods than conventional technologies for producing real-time or near-real-time data. Innovative technologies are demonstrated under field conditions and results are compiled, evaluated, published, and disseminated by the Office of Research and Development (ORD).

Evaluations or demonstrations have now been completed for 45 technologies in the MMT Program. The MMT Program is administered by ORD'S National Exposure Research Laboratory at the Environmental Sciences Division in Las Vegas, Nevada. Technologies demonstrated under the MMT Program are listed in Appendix A.

Program Planning

To ensure that the SITE Program continues to focus on validating the most sought-after remediation technologies, overall program direction and strategies are now evaluated each year based on input from the user community and other private- and public-sector stakeholders. As part of the overall program planning process, the SITE Program has developed and is implementing a quality management plan based on American National Standard Institute, Specifications and Guidelines for Quality Assistance for Environmental Data Collection and Environmental Technology Programs (ANSI/ASQC E4). This plan will enable the program to focus more clearly on long-term quality assurance and planning issues that impact overall program performance.

Matching Priority Sites with Innovative Cleanup Solutions

The SITE Program solicits and prioritizes hazardous waste sites, and then seeks appropriate technologies for demonstration at these sites. Priority sites are selected based on feedback from the user community, including federal and state agencies. Matching a site with a technology is a flexible process, and a site owner has the option of evaluating multiple technologies. If no specific technology or vendor is identified by a site, technologies and vendors are matched by the SITE Program and other interested parties, which may include state and federal regulators and other public representatives.

The selection of sites for the program is based on the research needs of EPA, as well as federal and state agencies.

An important aspect of technology selection is that more than one technology may be introduced for review and demonstration. This aspect allows for matching the most appropriate and feasible technology to a particular site. General technology needs of the user community are identified by soliciting input from working groups, forums, personal communication, and hazardous waste publications. With this continuous input, the SITE Program will continue to focus on the needs of the remediation community and the more pressing problems at contaminated sites.

Technology Field Demonstrations

Field demonstrations are conducted to provide quality data to evaluate technology performance. Project planning is an integral part of the demonstration process, and ensures that quality assurance/control and statistical analysis issues have been addressed in advance of initiating a demonstration. The resulting data and reports are intended for use by the site owners and state and federal decision-makers in evaluating remediation options and for adding credibility to technology vendors promoting their processes.

SITE Program technology demonstrations are increasingly conducted in partnership with other EPA offices, other federal agencies, states, private industry, and universities. These partnerships not only reduce the overall costs of demonstrations to EPA, but also accelerate remediation of some of the most problematic sites at federal and state facilities and significantly subsidize the technology vendors via site/logistical costs. One example of interagency partnerships is with DOD, Navy at Pearl Harbor. This group is currently working on a demonstration evaluating technologies to remediate DNAPL at Pearl Harbor, Hawaii.

Information Dissemination

As part of its continuing improvement process, the SITE Program recognized the need for expediting the progression of demonstration data from the program to the user community. The expansion of its electronic information sources was identified by the SITE Program as the most effective means for accomplishing this task. As a result, the amount of information on innovative technologies available through electronic sources is growing rapidly, with the Internet as the primary conduit.

Electronic documents are accessible through the Internet at the SITE Program web page, Environmental Technologies Verification (ETV) web site *(http://www.epa.gov/etv/),* SITE Program web page, (*http://www.epa.gov/ORD/SITE*) and a site supported by the EPA Office of Solid Waste and Emergency Response Technology Innovation Office (TIO) (*http://clu-in.org*). Several technology databases and publications summarize information about innovative treatment technologies and associated vendors, and are useful tools in identifying potential technology demonstration candidates or serve as directories for technology vendors. Examples include, but are not limited to, Remediation and Characterization Innovative Technologies (REACHIT) online system (*http://epareachit.org*), Innovative Remediation Technologies: field scale demonstration projects in North America, 2nd Edition (*http://cluin.or/proudcts/nairt*). Descriptions of the databases and publication ordering information are provided in Appendix D.

The development of technical documents within the SITE Program is a dynamic process, with a continual drive towards presenting data in its most usable form. The primary products of these efforts are information documents on a variety of technologies or applications for a specific area of interest. For example, SITE is currently developing a decision tree to help environmental professionals determine whether phytoremediation is appropriate for a given site. This decision tree will be for the consideration of phytoremediation to treat metals in three media: soil, groundwater, and sediments.

The SITE Program aggressively pursues opportunities for direct interaction with the user community and technology developers to anticipate needs and emphasis areas for development of future innovative technologies. Meetings and conferences continue to be an important factor in the dissemination of technical information generated by the SITE Program and were utilized to their full potential during FY 00.

The SITE Program provided a booth and representation at 12 conferences in FY 00, with staffing to provide information, documentation, and guidance to conference participants interested in the program. These forums offer face-to-face discussion among the user community, technology developers, and the SITE Program, and serves to generate ideas for future development and use of innovative technologies. The following mechanisms are used by the SITE Program to disseminate information and increase interaction with the user community:

- Program-specific brochures and exhibits
- Conferences, workshops, and technical working groups
- Publications and videotapes (see Appendix C)
- Electronic media, including the Internet
- Technical assistance to regions, states, and remediation contractors
- Technology seminars